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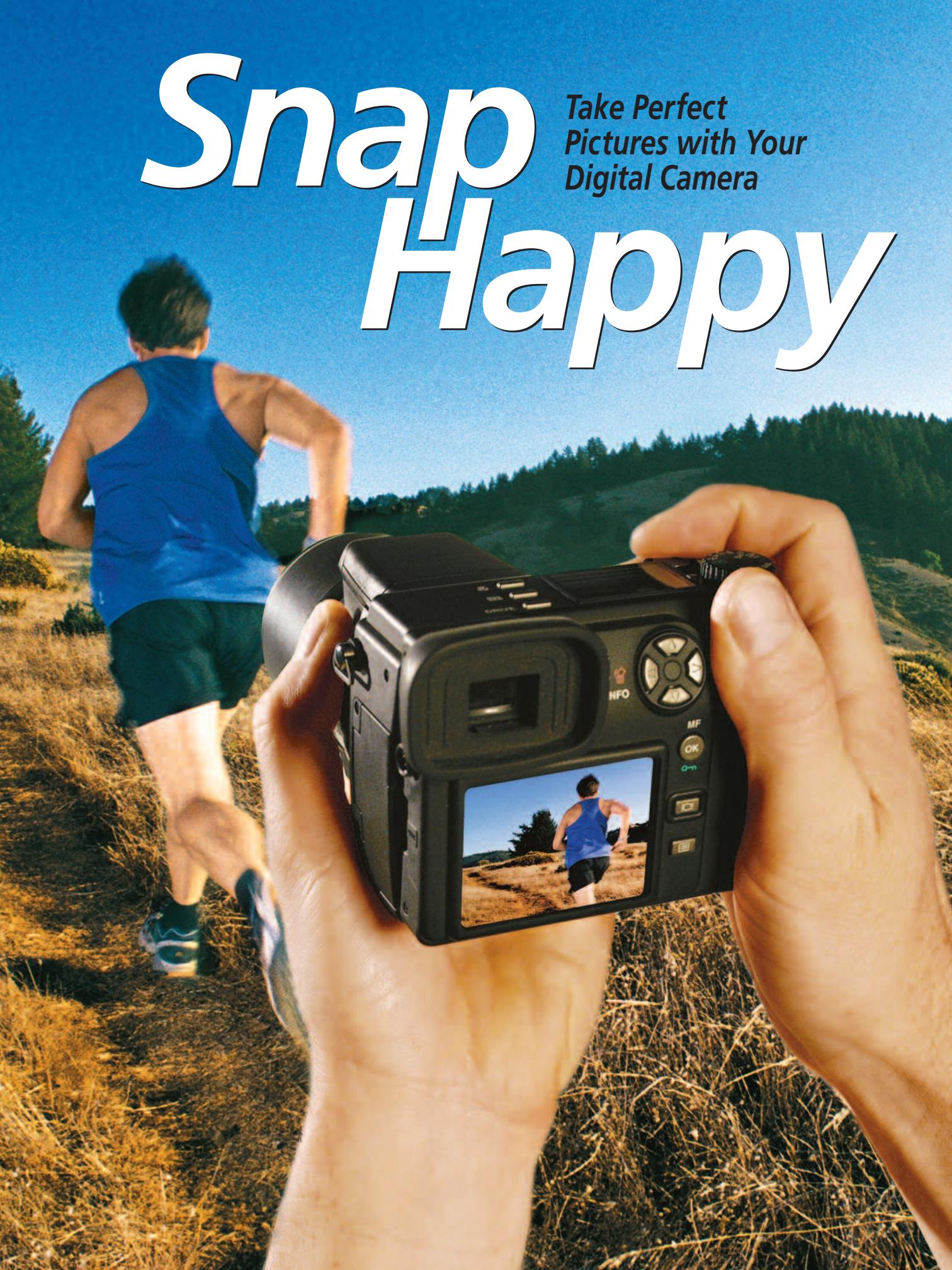
Power Guide to Digital Photography



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Snap Happy

*Take Perfect
Pictures with Your
Digital Camera*



With their instant feedback, reusable media, and excellent image quality, today's digital cameras offer great advantages over their film counterparts. What's more, most digital cameras provide intelligent auto modes that do much of the difficult photographic work for you. But as sophisticated as they are, even the best auto modes can't get it right every time. If you're constantly struggling to fix images that are too dark, washed out, or just not the shot you were hoping to

capture, you're probably not taking advantage of everything your digital camera offers. To get the best pictures possible, you'll need to make some smart choices about your camera's settings.

When shooting a photograph, you may be tempted to think, "This is good enough; I can always correct it later in Photoshop." But no matter how skilled you are at image editing, it's wise to start with the best image you can capture.

In this article, we'll take an in-depth look at your digital camera's controls and show you how to get great photos—even in some notoriously challenging situations.

Balancing Quality and Size

One of the first things you should do when preparing to shoot is pick resolution and compression settings. In truth, you probably won't change these settings very often, but since they directly affect the quality of your images and how many shots you can take, it's important to understand the trade-offs involved with each.

Your digital camera's resolution setting (expressed in width and height) determines the number of pixels the camera uses to capture an image. Images with higher resolutions show more detail, but they also consume more space—so your camera's storage card can't hold as many of them.

The compression setting affects the overall quality of your image. All digital cameras compress images before storing them. Low compression rates result in larger files and better-looking images. The more you compress an image, the more its quality degrades. (Confusingly, some cam-

eras express compression in terms of image quality—for example, good, better, and best. In these cases, higher settings actually result in lower compression rates.)

Storage is becoming increasingly inexpensive, so you can avoid compromising image quality simply by buying more storage cards. This way, you can leave your camera's settings at the highest resolution with the least compression.

But if you're running out of room and want to squeeze in a few more images, you'll need to adjust the camera's settings. If you plan on printing your images, it's best to set the resolution as high as possible and increase the compression. This may introduce some compression artifacts, but these won't degrade print quality as much as a low resolution will (see "Balancing Act").

If your destination is e-mail, video, or the Web, image size isn't much of a concern.

Balancing Act

Although a high compression setting will let you fit more images on a storage card, it will also degrade your images and increase the number of compression artifacts—square, blotchy patches of color.



Where Was That Again?

Almost every digital camera has a unique interface and organization scheme for its settings and controls. If you're not sure where to find some of the features we mention, consult your camera's manual. If the documentation has gone the way of lone socks and spare keys, don't worry. Most companies offer downloadable PDF versions of camera manuals on their Web sites.

Here are some commonly used icons to look for when you're searching through your camera's menus and options:

White Balance

	Sunlight/Outdoor
	Cloudy
	Incandescent/Indoor
	Fluorescent

Program Modes

	Portrait
	Twilight/Low Light
	Landscape
	Sports

Set the compression to the best quality (lowest amount of compression) and decrease the resolution. In most cases, you can set the resolution as low as 640 by 480. (For more on compression and resolution, see "Size Matters: Preparing Your Photos for Web or Print.")

Finding the Right White

Our camera's outdoor white-balance setting (right) produces a much warmer image than its auto white balance (left).

Seeing the Light

Developing a keen eye for light quality is an essential part of getting great shots. Each time you prepare to shoot in a new location, you need to make some quick decisions about the available light. How bright is it? What's the source? The answers will help you choose the correct ISO (light sensitivity) and white-balance settings for your images.



ISO Different types of film have different characteristics. Some film is formulated for indoor shooting while some is for outdoor use; other film, due to its increased sensitivity to light, is best suited to shooting in low light.

You can also adjust your digital camera for different types of light. But unlike film cameras, which carry only one type of film at a time, digital cameras can be adjusted on a shot-by-shot basis, so you don't have to commit to a particular type of light sensitivity for all your shots.

Light sensitivity is measured using a scale called ISO. Many digital cameras provide a choice of ISO values—usually 100, 200, and 400. As the ISO value increases, the digital camera becomes more light-sensitive. But high ISO values, like high compression, have drawbacks—they produce nosier images.

In general, a camera's auto-ISO feature will yield good results. But if you want to shoot in a low-light situation where a flash is not appropriate—for example, at a theatrical performance—then you'll want to consider cranking up the ISO.

White Balance You should pay attention not only to the amount of light but also to the light source. Different kinds of light have different color qualities. Photographers refer to these differences as *color temperature*. For example, sunlight, which tends to be blue, has a different color temperature than incandescent light, which tends more toward yellow.

A keen eye for light quality is an essential part of getting great shots. How bright is it? What's the light source? The answers to these questions will help you choose the best settings.



Size Matters: Preparing Your Photos for Web or Print

Before you can share images with others, whether through print, e-mail, or the Web, you'll probably need to resize them. You can do this in just about any image editor—for example, Adobe Photoshop or, if you don't have \$609 to spend, its more economical sibling, the \$99 Photoshop Elements (800/833-6687, www.adobe.com).

You can resize an image by adjusting its pixel dimensions, its resolution, or both. Pixel dimensions are the width and height of an image, as measured in pixels. The pixel dimensions of a typical 2-megapixel image are 1,600 by 1,200.

Resolution is a measure of how closely those pixels are spaced. At 72 pixels per inch (ppi), a 1,600-by-1,200 image will measure 22 by 16 inches. At 300 ppi, it'll measure 5 by 4 inches, because those same pixels are packed closer together.

Resizing for the Web

If your images are destined for the Web or e-mail, 1,600 by 1,200 pixels is too big. After all, the average computer screen is only 1,024 by 768 pixels. You'll probably want to knock the image down to around 400 by 300 pixels and 72 ppi (the resolution of most monitors).

To discard some pixels in Photoshop Elements, a process called *resampling* or *downsampling*, open the Image Size dialog box (Image: Resize: Image Size). Make sure the Resample Image option is selected. Enter the pixel dimension you want in the Width or Height field (see "Slimming Your Photos"). The Resolution field should be set to 72 ppi.

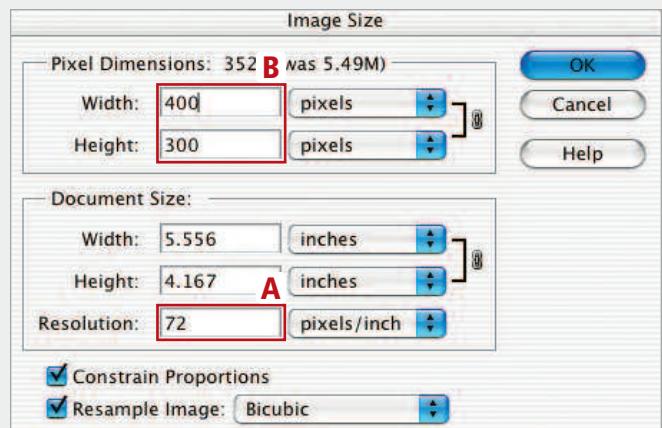
Although making an image smaller means that fine detail will be lost, downsampling doesn't usually degrade quality. In fact, your image might even get a little sharper.

Resizing for Print

If your final destination is print, you'll need to make a few additional decisions. First you must choose a resolution. Though your printer may claim that it prints 1,440 dpi or more, your images don't need such a high resolution, because your printer uses several different colored dots to re-create the color of each pixel in your image. In other words, there is not a direct 1:1 correspondence between those 1,440 printer dots and the pixels on your computer screen.

For the typical desktop ink-jet printer, 240 ppi is the highest resolution you need. If you plan to send your photo to an online printing service after editing it, check the service's Web site for resolution recommendations. In many cases, 300 ppi will suffice. To adjust your resolution for printing, deselect the Resample Image option and enter a new number into the Resolution field. Elements will adjust the document's size to match the resolution you entered. At 240 ppi, a 1,600-by-1,200 image measures 6.6 by 5 inches.

But what if you want to print a smaller image—one, say, 5 inches wide? As in the earlier example, you'll need to downsample. But instead of entering new pixel dimensions, simply enter your desired document size. Again, make sure



Slimming Your Photos To shrink a photo for displaying on the Web or inclusion in an e-mail message, set the resolution to 72 ppi **A** and enter the new pixel dimensions **B**.

that the Resample Image option is selected. Elements will then automatically calculate the appropriate pixel dimensions.

Note that unlike a 35mm film camera, which uses a 3:2 aspect ratio for its images, most digital cameras use a 4:3 aspect ratio. As a result, a digital image that's 5 inches wide is actually 3.75 inches high, not the standard 3.5 inches. To print digital images in traditional film sizes, first set your resolution as we've described and then crop your images to the appropriate size.

If you want to go bigger, to print at 7.5 by 10 inches, for example (you can't go to a full 8 by 10 inches because of the camera's 4:3 aspect ratio), you have two options. With the Resample Image option selected, enter the new document dimensions, and let Elements *interpolate* (make up new pixels) to create the larger document. This process is called *upsampling*. The downside is that this may create new artifacts and aberrations in the image. Most notably, diagonal lines can become jagged, or *aliased*.

The second option is to *deselect* the Resample Image option and then enter new document dimensions. This spreads out the original 1,600 by 1,200 pixels over a 7.5-by-10-inch image. In the process, the resolution will drop to 160 ppi.

So which is the better option? In this case, it's probably better to upsample. Photoshop's resampling algorithms are very good and aren't likely to introduce too many artifacts after such a small resizing. Printing at a lower resolution, though, will result in a marked softening of the image.

It's important to note that resampling—either up or down—can have a profound effect on an image's sharpness. Downsampling results in a sharper image, and upsampling produces softer images. For this reason, it's a good idea to perform any necessary resizing *before* you apply sharpening filters.

Your eyes can adjust to changes in color temperature, so colors look the same no matter what kind of light you're in. However, your digital camera doesn't fare as well. To render color accurately, a digital camera has to know what kind of light you're shooting in so it can compensate—this process is called *white balancing*.

Most cameras come with an automatic-white-balance feature that adjusts the camera for the current lighting. But this feature can sometimes get confused, particularly if you're shooting a scene that features a

single dominant color or includes different types of light (sunlight streaming into a room lit with fluorescent light, for example).

In these situations, you'll need to adjust the white balance. Most cameras include white-balance presets for all of the normal types of light: daylight, daylight with clouds, incandescent, and fluorescent (see "Finding the Right White"). If your camera's automatic-white-balance feature is unreliable, you may want to switch to one of the preprogrammed modes whenever you change lighting situations.

Flash Photography: Beyond the Basics

Everybody knows what the camera's built-in flash is for, right? It goes off automatically when there's not enough light. And everybody knows how ornery and feeble these flashes can be. If you're too close to your subject, the flash blows out the picture, turning your best friend into a ghost. If you're farther than about eight feet away, the flash is too weak to do anything useful at all.

No matter what kind of camera you have, you'll take your best pictures if you decide when to use the flash, instead of letting the camera decide. Believe it or not, the camera's automatic flash is wrong about half the time.

Fill Flash

If you set the flash to auto when you shoot outdoors, the camera will conclude, more often than not, that there's plenty of light in the frame, and it



A Helping Hand When left in auto flash mode (left), the camera reads the background, the lawn, the reflections—everything except the person in the foreground. As a result, your subject is underexposed and too dark. Forcing the flash (right) solves the problem nicely.

won't bother to fire the flash. But it's not smart enough to determine whether the person you're photographing is, in fact, in shadow (see "A Helping Hand"). As a result, you'll be left with an underexposed subject against a brightly lit background.

The solution in this situation is to *force* the flash on. Provided you're close enough to the subject, the flash will provide enough fill light to balance the subject's exposure with that of the surrounding background. So how do you take your flash out of auto mode? Most cameras offer a couple of different flash settings. Cycle through your camera's flash modes until you get to the forced-flash icon (usually a single lightning bolt). Stand within eight feet of the subject so you can get enough flash for a proper exposure.

This kind of fill flash will dramatically improve your outdoor portraits. It will eliminate the silhouette effect when your subject is standing in front of a bright background, and it creates a flattering frontal light that softens smile lines and wrinkles and puts a nice twinkle in the subject's eyes.

Rim Lighting

Once you've experimented with fill flash, try this technique that pros use to create striking portraits: Position the subject with her back to the sun (preferably when it's high above the horizon and not shining directly into your camera lens). Set your camera to forced flash. If the sun is shining into the lens, block it with your hand or a lens shade. The sun creates a *rim light* around the subject's hair (see "Capturing Rim Lighting"). You'll also notice that her eyes are more relaxed and open. In one swift move, you've made your subject more comfortable and improved your chances for a dramatic portrait.

Take a few pictures and review your work on screen. The forced flash should create a nice fill light. If your model is too bright, move back a few steps and try again. If she's too dark, move a little closer. (If your camera accepts filters, try a softening filter for rim-lighting shots. It can reduce facial wrinkles and create a nice glow around the subject's head.)

When it works, rim lighting creates portraits that you'll be very proud of. It's not the right technique for every situation, but sometimes it produces jaw-dropping results.

Tips from the Pros Some digital cameras offer a manual white-balance control. If you have this feature and want a truly accurate white balance, get a piece of white paper and place it in your shot. (Don't hold the paper

directly in front of the camera. It needs to be illuminated by the light in your scene.) Zoom in on the paper so that it fills a large portion of the image, and activate the manual white-balance feature. The camera will examine the white paper and calibrate itself for the current lighting. As with the white-balance presets, if you change to a different lighting situation, you'll need to take a new white-balance measurement.

Another advanced feature that can come in handy—if your camera offers it—is white-balance bracketing, which automatically shoots the same image multiple times using a variety of slightly altered white-balance settings. This feature is useful if you're particularly unsure about the lighting, or if color accuracy is extremely important.

Getting the Perfect Exposure

Once you've selected appropriate ISO and white-balance settings, you're ready to frame your shot. The most important consideration here is good exposure.

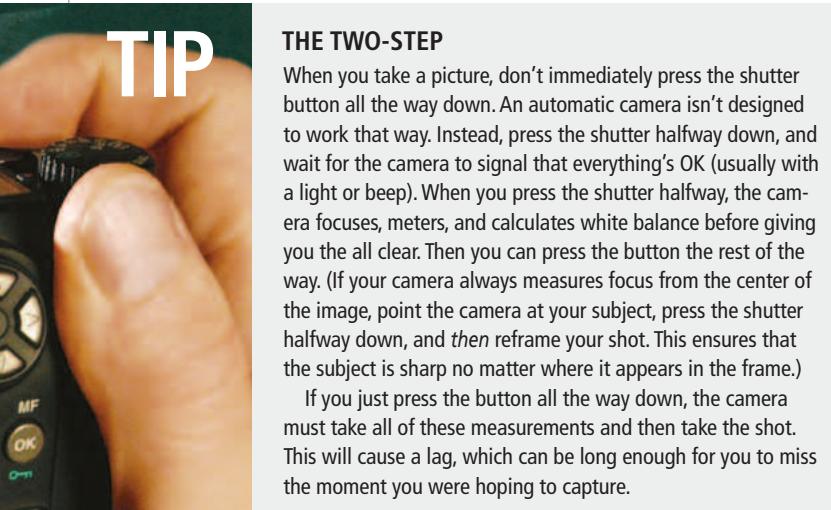
At the simplest level, your camera's exposure controls ensure that there's enough light to yield a good image

TIP

THE TWO-STEP

When you take a picture, don't immediately press the shutter button all the way down. An automatic camera isn't designed to work that way. Instead, press the shutter halfway down, and wait for the camera to signal that everything's OK (usually with a light or beep). When you press the shutter halfway, the camera focuses, meters, and calculates white balance before giving you the all clear. Then you can press the button the rest of the way. (If your camera always measures focus from the center of the image, point the camera at your subject, press the shutter halfway down, and then reframe your shot. This ensures that the subject is sharp no matter where it appears in the frame.)

If you just press the button all the way down, the camera must take all of these measurements and then take the shot. This will cause a lag, which can be long enough for you to miss the moment you were hoping to capture.



Indoor Flash

Another challenging flash situation is indoor photography. Over the years, you've probably seen plenty of indoor flash photos that have a pitch-black background and an overexposed, practically nuked subject. This is because the light from a typical digital camera's flash reaches only about eight to ten feet. But you can make certain adjustments to prevent the room's background from falling into a black hole.

Manual Adjustments If your camera has a manual mode that allows you to dictate both the aperture (f-stop) and shutter speed, try this combination as a starting point for flash photography indoors: set your film speed to 100, the aperture to f5.6, and the shutter speed to $1/15$ of a second. Turn on the forced-flash mode. (Don't use the red-eye reduction feature.)

Hold the camera as steady as possible. (At these slow shutter speeds, your shots are more vulnerable to camera shake. Your flash will help freeze everything in its range—but the background, not illuminated by the flash, may blur if the camera isn't steady.) As you review the shots, you'll see that they look much different than what you're accustomed to. Specifically, the camera captures more of the room's ambience and background detail.

Slow-Synchro Flash If your camera doesn't have a manual mode, all is not lost. Almost all consumer models have a nighttime or slow-



Capturing Rim Lighting Remember being told to have the sun at your back when taking a picture? That's not always the best advice for portraits. In fact, you may want the sun on the model's back to create a rim-light effect.

but not so much light that your image washes out. It does this by balancing its shutter speed (the amount of time the shutter stays open) with its aperture (the size of the lens' opening). Your camera's auto-exposure mode can produce good results for most scenes, but for difficult shots such as quick motion, or specialty shots such as soft backgrounds, you'll often get better results if you take over some of the controls. When used correctly, your camera's exposure controls can provide tremendous creative possibility.

Light Metering No matter what your photographic goals are, the key to getting properly exposed images lies in your camera's light meter. When you press the shutter button down halfway, the camera runs through a list of tasks: it calculates an appropriate focus, selects a white balance, and uses the light meter to measure the amount of light in your scene and determine an appropriate shutter speed and aperture.

However, your meter doesn't necessarily choose a shutter speed and aperture that will yield the *best* image—just one that is neither too bright nor too dark. Your camera's light meter always assumes that it's



A Little Ambience, Please Tired of having your flash subjects lost in a black hole of darkness? Try using what photographers call "slow-synchro flash." Set your camera's shutter speed and aperture manually to control the exposure of the background. The camera's flash will ensure that the subjects are exposed properly.

synchro mode, often indicated by a crescent-moon icon or stars over a mountain. This mode is for shooting portraits at twilight, but you can also use it indoors to open up the background (see "A Little Ambience, Please"). Granted, you don't have as much control with this setting as you do with a manual mode, but you might be pleasantly surprised by the results.—DERRICK STORY



By the Book This is an excerpt from *iPhoto: The Missing Manual* (O'Reilly/Pogue Press, 2002), by Derrick Story, David Pogue, and Joseph Schorr. Derrick Story is also the author of *Digital Photography Pocket Guide* (O'Reilly, 2002), a complete guide to the ins and outs of digital cameras—including tips for shooting in just about every situation you may come across (www.oreilly.com/catalog/digphotopg).

pointed at something that is 18 percent gray, because generally, a scene reflects 18 percent of the light that strikes it. While this assumption is often right, you may need to tweak the camera's exposure settings to get the best results (for tips, see "True Colors: Compensating for Automatic Exposure").

How a camera meters an image can dramatically affect the accuracy of the exposure. Today, many cameras offer metering options: usually matrix, center weight, and spot. Matrix metering divides your scene into a grid, meters each cell, and then calculates an exposure based on all of that metering. Center-weight metering takes the same approach but prioritizes the center cells (where your subject most likely is). Spot metering measures just a narrow portion of the center of the image.

So which meter should you choose? Because of its big-picture approach, matrix metering is the best option for most situations. If there's a marked difference in lighting between the background and the subject in the center of a scene—a person standing in front of a window, for example—center-weight metering is a better option.

TIP



BETTER PORTRAITS

One of the best ways to bring more focus to a subject is to choose an exposure that yields a shallow depth of field. Unfortunately, depth of field is partly a function of focal length, and most small digital cameras have extremely short focal lengths—so you can't get depth of field that's as shallow as what you'd get from a camera with long lenses. Here, we used our camera's portrait mode to soften the background. You could also use the aperture-priority mode to choose a low f-stop (wide aperture). Then the camera automatically chooses an appropriate shutter speed. If you're not satisfied with the degree of softness in the background, increase the distance between it and the subject.



Choose spot metering if you're in a difficult lighting situation and want to make sure that a specific element in your scene—regardless of its position in the frame—is well lit. For example, if a scene includes patches of bright light and shade but the subject is off to the side, you can use spot metering to meter the subject and then reframe the shot before pressing the shutter button completely.

Fine-Tuning Exposure Once the light meter lands on an exposure, you can choose to either shoot with that exposure or, if you think the shot requires it, adjust the calculated shutter speed or aperture to better serve your photographic intent.

For any given light-meter reading, there are many different exposure combinations that result in the same amount of light hitting the camera's sensor. For example, doubling the aperture of a given exposure while keeping the shutter open half as long results in an exposure equivalent to the original. This interrelationship is called *reciprocity* and makes it possible to use different combinations of shutter speed and aperture values to achieve very different results from the same shot.

By altering shutter speed, you can control the camera's ability to freeze motion. Slow shutter speeds render moving images with lots of blur; fast shutter speeds freeze even the fastest action.

By altering the camera's aperture, you can control the image's depth of field, the measure of which distances are in focus. Aperture is measured in *f-stops*. Because it uses a *smaller* aperture, a high f-stop setting stops more light, thus producing a deep depth of field in which the entire image is in focus.

To create an image with shallow depth of field—for example, where only objects 6 to 12 feet away from the camera are in focus—use a very low f-stop setting. (But remember that because large apertures allow more light, you'll need to use a short shutter speed to get a good exposure.)

By controlling depth of field, you can blur out the background or foreground of the image to focus more attention on the subject (see "Better Portraits").

Using Exposure Modes Some digital cameras let you set both your shutter speed and aperture. But keeping track of these settings can be tedious. To make adjust-



Capturing the Light To get great nighttime shots like this, you'll need a tripod or other stable surface. Use your camera's night mode (usually represented by a crescent-moon icon) or, if your camera offers priority modes, set the shutter speed to about four seconds. And be sure to turn off the flash.

True Colors: Compensating for Automatic Exposure

If your light meter always calculates an exposure that's appropriate for 18 percent gray, how can it accurately calculate an exposure for other colors? The answer is, it often can't.

Say you take a picture of a black statue. Since the light meter assumes that the statue is 18 percent gray, the exposure it calculates will reproduce the black carving as somewhat gray (see "Getting Back to Black"). Similarly, if you were to shoot something white—a field of snow, for example—the light meter would produce an exposure that rendered the snow as slightly gray, rather than truly white.

To restore the blacks and whites in the image, you sometimes need to make adjustments. You'll overexpose to make whites whiter, and underexpose to make blacks blacker. Almost all digital cameras provide exposure-compensation controls, which let you simply dial in an amount of over- or underexposure.



Getting Back to Black With the automatic exposure (left), this black statue appears slightly gray, and background details (such as the columns) are washed out. To get a truer black (right), we underexposed the image by $\frac{1}{3}$ of an f-stop.

With these controls, you don't have to worry about an absolute shutter-speed or aperture value. Instead, you tell your camera to over- or underexpose by a maximum of two f-stops, usually moving in increments of $\frac{1}{3}$ of an f-stop.

The amount of exposure compensation you'll need varies, so it's best to bracket the shots by shooting multiple images with varying degrees of compensation. To make things easier, some cameras offer an autobracketing feature that shoots a series of images with different exposures whenever you press the shutter button.

Exposure compensation is not just for blacks and whites, though—the color tones in your image can also be changed. Just as white can be made more white by overexposing, bright colors will become brighter (less gray) by overexposing. In general, most colors will appear more saturated if you dial in a tiny bit of underexposure (usually $\frac{1}{3}$ of an f-stop will do).



ing your exposure easier, most cameras offer specialized shooting modes for some common types of situations. Usually selectable from a dial on the outside of the camera or from a menu on the camera's LCD screen, these specialty modes let you specify the settings you care about (for example, shutter speed) and tell the camera to take care of the rest.

Although the number of modes varies from camera to camera, the most common are for portraits, landscapes, sports shots, and low-light images. Each mode features a different priority for the exposure settings. For example, if you set the camera to portrait mode, it automatically selects a wide aperture (and corresponding shutter speed) to reduce depth of field and create a blurry background behind the subject.

A landscape mode typically has a very small aperture, to increase depth of field, and often locks the focus on infinity. These settings ensure that the entire scene will be sharp.

Sports settings prioritize for faster shutter speeds to stop fast-moving action; sand-and-snow settings intentionally overexpose the image to render bright scene elements—such as fresh snow—as the right color.

If you're looking for even more fine-tuned control over your image's aperture or shutter-speed setting, check to see if your camera offers *priority modes*. Rather than choosing the general effect you want, as with exposure modes, priority modes let you select a specific f-stop or shutter speed and tell the camera to do the appropriate calculations for you. For example, shutter priority allows you to select a shutter speed and leaves the choice of aperture to the camera, while aperture priority does the opposite.

The Last Word

If there's one fundamental rule for improving your images, it would be to pay attention to light changes (white balance), overall brightness (ISO), and bright or dark colors in the scene that need to be over- or underexposed. If you keep your eyes open and learn to correctly use your camera's controls, you should be able to capture images that accurately depict your artistic vision. □



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TIPS FROM THE PROS
TAKE YOUR DIGITAL PHOTOS
FROM DRAB TO FAB

▼ THE EXPERTS

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DESPITE THE POINT-AND-SHOOT EASE of most digital cameras, getting a perfect shot is hardly a simple process. Hey, even professional photographers don't always get it right. So why do their pictures look so much better than ours? True, the pros have had lots of practice; however, they also know how to use image-editing software to give their images a little extra oomph.

But here's a little-known fact: these tricks aren't hard. We went to the photography experts and asked them to share the secrets of the trade. They offered hands-on tips—on everything from exposing harsh shadows to correcting bad colors—to help you get great-looking images. And these experts had plenty of practical advice about printing and managing images, too.

13 EASY WAYS TO GIVE YOUR PHOTOS A PROFESSIONAL POLISH

Almost all images can benefit from some tweaking, whether it's with a simple sharpening filter or by full-fledged color correction. These minor nips and tucks can mean the difference between just another humdrum vacation photo and a frame-worthy work of art.

To help you fix your flawed photos, we went to the experts and asked them to share some of their favorite techniques. Each of these tried-and-true tricks works in Adobe Photoshop and/or Adobe Photoshop Elements, two of the most flexible and most widely used image-editing programs on the Mac (see "The Software"). Even better, they're all quick and easy, so you can get away from your computer and get on with enjoying your photos.

Straighten Crooked Images

The first thing I do when I open an image is check to see whether it's straight. You can quickly restore a sense of balance to off-kilter photos with Photoshop's Measure tool. First, find a straight line in your image that should be horizontal or vertical (the horizon or the side of a building, for example). Click on and hold the Eyedropper tool in the Tools palette, and select the Measure tool (it looks like a ruler) from the pop-up menu. Then click on one end of the line in your image and drag your cursor to the opposite end of the line. This tells Photoshop what needs straightening. Next, choose Image: Rotate Canvas: Arbitrary, and use the default Angle setting, which is calculated from the line you drew.

If you can't find an obvious horizontal or vertical line—or if you're using Photoshop Elements and the Straighten Image command doesn't solve the

problem (Image: Rotate: Straighten Image)—there's another option. Press ⌘-A to select the entire image. In Photoshop, go to Edit: Free Transform. (In Photoshop Elements, go to Image: Transform: Free Transform.) Now, click on the Angle setting in the Options bar at the top of your screen and press the up- and down-arrow keys on your keyboard until your image looks straight. Press return twice when you're done.—BEN WILLMORE

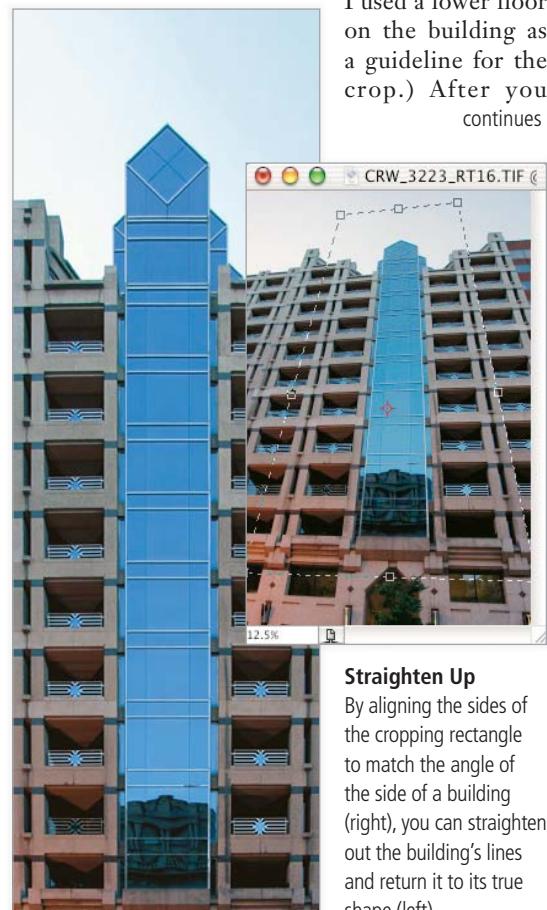
Get a Better Perspective on Buildings

If you have an image with converging lines—such as a photo of a very tall building shot from the ground—you can use the Crop tool to minimize the effects of perspective and rehabilitate the building's perpendicular lines (see "Straighten Up").

With the Crop tool selected, click and drag your mouse to create a cropping rectangle over your image, and then click on the Perspective check box in the Options bar at the top of your screen. Now drag each corner of the cropping rectangle until the corners are aligned with the four corners of the building you want to straighten. If you can't see all four corners in the image, you'll need to estimate where to place a few of the corners. (In my example,

I used a lower floor on the building as a guideline for the crop.) After you

continues



BEN WILLMORE

▼ THE SOFTWARE

There's no shortage of image-editing software on the Mac. In fact, Apple has built some useful editing tools right into iPhoto. But to go beyond the basics of lightening, sharpening, and cropping your photos, it helps to have a dedicated application. And we think two of the best are Adobe Photoshop and Adobe Photoshop Elements (www.adobe.com). Here's why:

Adobe Photoshop 7.0 is the professional standard for image-editing applications. It offers a complete suite of tools for correcting, polishing, and publishing your images. It also comes with a professional price—\$609. However, if you spend a lot of time getting your photos just right and feel constrained by more-limited applications, Photoshop may well be worth the money and effort.

Adobe Photoshop Elements 2.0 includes a lot of the features and tools found in Photoshop, but it has a simpler interface and a much more inviting price—\$99. Adobe designed the program specifically for casual digital photographers, building in easy-to-use features for eliminating red eye, scaling down photos for e-mail or the Web, and correcting color casts. It also comes bundled with some scanners and printers. You can download a trial version from Adobe's Web site if you'd like to try it out first.

All of our tips work in one—if not both—of these programs, and most also work in older versions of the software.

Straighten Up
By aligning the sides of the cropping rectangle to match the angle of the side of a building (right), you can straighten out the building's lines and return it to its true shape (left).

▼ LIGHTEN HARSH SHADOWS

SVEN WEIDERHOLT

**BEFORE****AFTER**

Even the most sophisticated digital cameras have trouble capturing scenes with strong shadows or harsh backlighting. In these cases, your camera's fill-flash feature can help by adding some much-needed illumination. However, if you forgot to turn it on when you were taking the photo, you can create the same effect after the fact with Photoshop.

The idea is simple: You find a channel that shows the strongest contrast between the photo's subject and its background. Then you use this

channel to create a mask of the troublesome shadows. Once you've selected the problem area, you can easily apply a host of image-correction tools to just these areas, leaving the brightly lit portions of the image untouched.

The process requires only a few minutes of work, and the result is very similar to the real thing. In fact, this technique makes a lot of images look better, regardless of the shooting situation.

STEP 1: CREATE A MASK CHANNEL

In Photoshop, open the Channels window and examine the Red, Green, and Blue channels in turn. Find the channel that shows the best contrast between the image you want to lighten and the background. (For this example, we chose the Blue channel.)

When you've found the channel, duplicate it by dragging its title onto the Create New Channel icon at the bottom of the Channels window. A copy of the duplicated channel appears at the bottom of the list. Double-click on its title, and rename it "Mask."

STEP 2: MODIFY THE LEVELS

To make an effective mask, you'll need to exaggerate the tonal difference between your subject and the brighter background. With the new Mask channel selected, open the Levels control panel (Image: Adjustments: Levels). Adjust the sliders to make your subject as dark as possible, while also lightening the background and eliminating most of the tonality there.

STEP 3: INVERT THE IMAGE

Photoshop's masking features follow the metaphor of film masks: white areas allow an effect to take place, while black areas are treated as opaque and are therefore unaffected. Since you want this mask to affect the image's shadows, you need to Invert (⌘-I) the current image to create a negative.

STEP 4: REFINE THE MASK

Your photo's background probably contains at least some shadows (represented by white or gray areas). Because you don't want to lighten these

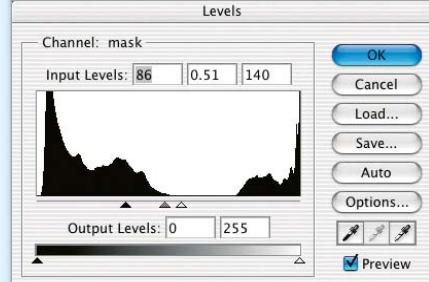
areas along with your subject, you'll need to remove them from your mask. With the Brush tool set to black, paint over any areas that you don't want to change. When you're done, add a small amount of Gaussian Blur (Filters: Blur: Gaussian Blur)—usually between 0.25 and 1.5 pixels. This will soften the edges of the mask, preventing its effect from being too obvious in the final image. You don't have to be terribly careful here, as this process is very forgiving.

STEP 5: APPLY THE MASK

Once your Mask channel is complete, return to the image's RGB view by clicking on the RGB title in the Channels window. Your original image should appear unaltered. Next, open the Select menu and choose Load Selection. If it's not already selected, choose Mask from the Channel pull-down menu and then click on OK. Photoshop will create a selection area based on your Mask channel. If you find the moving selection indicator too distracting, you can hide it by pressing ⌘-H.

You can now use Levels or Curves to lighten your subject appropriately. Keep in mind that if you go too far, the image will have areas of posterization.

If an overall tonal adjustment is needed, simply deselect the mask (⌘-control-D), and you're free to modify the entire image. If you want to preserve the Mask channel in case you need to make future adjustments, save the image as a TIFF or a Photoshop file.—BRIAN P. LAWLER

**STEP 1****STEP 2****STEP 4**



Heavenly Beauty

By darkening the sky, you can turn a pretty landscape (left) into a dramatic vision (right).

have all four corners positioned so that the sides of the cropping rectangle line up with the sides of your object, drag the side handles (*not* the corners) of the crop outline until most of your image is within the cropping rectangle. When you press return, the top of your image will stretch to straighten your lines and give the illusion that the photo was taken from straight on rather than from the ground.—BW

Create Stunning Skies

For a truly dramatic landscape, darken the skies in your images while keeping the lightest areas of any clouds bright (see "Heavenly Beauty").

First, select the sky in your image. If there's a well-defined edge between the sky and the foreground, you can use the Marquee tool to select the general tones of the sky—be careful not to

include any other elements—and then choose Grow from the Select menu. (If this doesn't produce an effective selection, use one of the lasso tools to create a more accurate selection.) When you have your selection, choose Layer: New Fill Layer: Solid Color. Set the Mode pop-up menu to Color Burn, and click on OK. When the Color Picker appears, click on the white area. Slowly select darker and darker grays until the sky looks the way you want it to.—BW

Control Contrast

Photoshop's Levels feature (⌘-L) is great for tweaking the brightness and contrast of your image. By moving the three arrows beneath the Level's histogram, you can quickly adjust your image's shadows, highlights, and midtones. The only prob-
continues

▼ OUR FAVORITE DIGITAL CAMERAS

When you buy a new digital camera, there's no shortage of options. In fact, it seems that every few months a new generation of cameras appears in our lab, sporting a slew of new features and new, lower prices.

Digital cameras are typically grouped—and priced—according to how many pixels they capture. If you're primarily looking to get 4-by-6-inch prints or to publish your images to a Web site, a 2- or 3-megapixel camera will certainly do the trick. However, if you want the option of printing sharp, detailed images larger than 5 by 7 inches, you'll need more pixels. A good 4- or 5-megapixel camera will let you print crisp images as large as 11 by 17 inches and even larger.

Here are a few of our current favorites:



PANASONIC LUMIX DMC-FZ1

This 2-megapixel camera stands out thanks to an amazing 12x zoom with optical image stabilization, which helps prevent blurry images. It's also a lot of fun to use (4 1/2; see our review on page 38).

COMPANY: Panasonic, 800/742-8086, www.panasonic.com

PRICE: \$449



CANON POWERSHOT A70

This 3.2-megapixel camera comes with a full suite of manual controls and an autofocus illuminator for focusing in low light. It also supports conversion lenses and an underwater case (4 1/2; July 2003).

COMPANY: Canon, 800/652-2666, www.powershot.com

PRICE: \$399



PENTAX OPTIO 550

This compact 5-megapixel camera from Pentax offers a 5x optical zoom, manual exposure controls, unique digital color filters, and a great battery life—considering how small it is. (Look for a full review in an upcoming issue.)

COMPANY: Pentax, 800/877-0155, www.pentax.com

PRICE: \$600

lem is that this feature also has a tendency to shift the *colors* in your image—and not necessarily for the better. Not to worry. You can prevent this by choosing Fade from the Edit menu immediately after adjusting Levels. In the Fade dialog box, set the Mode pop-up menu to Luminosity. (If you used an adjustment layer to change your Levels, set the blending mode in the Layers palette to Luminosity.) Keep in mind that the Fade command works only immediately after you've applied an adjustment, so make sure you don't do anything else before setting it.—BW

Get Rid of Noise

Digital cameras are notorious for creating images that contain colorful noise—bright specks that make photos appear mottled and distract the eye. Noise is especially common in conditions of low light and high ISO settings. Although it's difficult to remove noise completely, you can often reduce the appearance of these colorful specks by using the Gaussian Blur filter (Filter: Blur: Gaussian Blur).

Move the Radius slider to the right until the noise blends into the image. Don't worry if your image begins to look blurry—we'll fix that. Immediately after applying the filter, choose Edit: Fade and change the pop-up menu from Normal to Color. That should bring back the detail in your image while making any remaining noise match the color of the surrounding image.—BW

Brighten Bland Colors

If your image's colors are a little dull, you can give them a quick boost by adjusting the saturation levels. In Photoshop or Photoshop Elements, press ⌘-U to open the Hue/Saturation dialog box. Move the Saturation slider toward the right to make the image more colorful. But be careful: some colors may start to look artificially bright before others have reached their full potential. When this happens, choose a color from the Edit pop-up menu at the top of the dialog box (even if the color you're looking for isn't listed) and

▼ QUICKER CROPPING

Digital images have a different aspect ratio than film images. This means that if you want to print them at standard sizes (to get 4-by-6- or 5-by-8-inch prints, for example), you'll need to crop them first.

Cropping isn't difficult, but it can be tedious work—especially if you're preparing a large batch of pictures that all need to have the same dimensions and resolution. Thankfully, there's a way to speed up this process in Photoshop and Photoshop Elements.

With the Crop icon selected in the Tools palette, take a look at the Options bar along the top of your screen. (If it's not there, open the Windows menu and select Options.) You should see three fields labeled Width, Height, and Resolution. By setting these, you can constrain the tool so it crops to the exact same dimensions every time you apply it until you clear the settings.

For example, imagine you're creating a Web page in which you want all the images to be 400 pixels wide and 300 pixels tall at 72 pixels per inch. Type **400 px, 300 px**, and **72** into the Width, Height, and Resolution fields, respectively. Click and drag the Crop tool across your image to select the area you want, and click on OK. The program will automatically scale down your cropped image to the size and resolution you entered. And since your Crop tool will remember these dimensions for every image you open until you reset it, you'll be able to whip through that folder of pictures in a fraction of the time it used to take.—DERRICK STORY



Constrained Crops Enter the settings you want to use for your cropping, and Photoshop will apply them every time you use the tool until you erase them by clicking on the Clear button.

then click on the problematic color within your image. Now move the Saturation slider back toward the left to mellow out just the color you selected (see "Colors of Spring").—BW

Sharpen Fuzzy Images

Almost every digital photograph you take will benefit from sharpening. The trick is to apply enough filtering to create a clean, crisp image but not so much that it appears edgy and, well, digital-looking.

continues



Colors of Spring In the original image (left), the sunflowers appear dull and flat. By boosting the saturation (center), I got richer yellows but unnatural green tints. To compensate, I then lowered the saturation in just the green areas (right).

▼ GET BETTER GRayscale



SYEN WEIDERHOLT

Simple Elegance With a little experimentation, you can turn a color photo into a richly textured black-and-white image.

Black-and-white images have a grace and beauty that's hard to match. However, if you convert color photos by simply selecting Photoshop's Grayscale mode, you may not be getting the best images you can.

When you convert to Grayscale mode, Photoshop mixes the red, green, and blue channels together, weighting each one differently according to a standard formula. But in many cases, this weighting process loses more information than it keeps.

Luckily, there are many gray-scale images hiding away in any color file—some only a click or two away. Here are three different approaches to coaxing the best black-and-white images from your photographs.

Choose a Channel One simple option is to look at the individual color channels in the image. Sometimes you'll find the perfect gray-scale image sitting in one of them. If you find one you like, you can then copy and paste it into a new document (or select Duplicate Channel from the Channel palette's Option menu and then choose New from the Document pop-up menu).

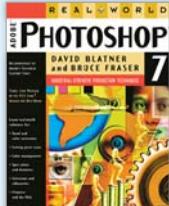
Desaturate First To get a different result, desaturate the image before converting it to gray scale. Select Desaturate from the Adjustments submenu (under the Image menu) or press ⌘-shift-U . This literally pulls the color out of each pixel in the document. At this point the image is still RGB. But if you convert it to grayscale now, you'll get a different result than if you'd simply converted it to gray scale at the start.

Mix It Up If you don't find a satisfactory image with the previous methods, try the more devious alternative: manually blend your channels to get the right mix. The process is a little more time-consuming but offers greater control over the finished image.

In Photoshop's Channel Mixer (Image: Adjustments: Channel Mixer), you mix channels by altering their percentages. To create a gray-scale image, make sure the Channel Mixer's Monochrome option is selected. This ensures that the image will be neutral gray.

To maintain the overall tone of the image, make sure that the percentages in the dialog box always add up to 100 percent. (Of course, there may be situations where you don't want to maintain the overall tone of the image.) We wish there were a way to constrain the percentages in this way, but unfortunately, you'll have to do the math.

Rather than applying the effect directly to an image, we prefer to use the Channel Mixer on an adjustment layer (Layer: New Adjustment Layer: Channel Mixer). This way, if you need to adjust your image later, you can just double-click on the adjustment layer's tile in the Layers palette and refine the Channel Mixer settings.—DAVID BLATNER AND BRUCE FRASER



This article is an excerpt from *Real World Adobe Photoshop 7* (Peachpit Press, 2002), by David Blatner and Bruce Fraser. You can find the book at www.peachpit.com or your local bookseller.

However, knowing *when* to sharpen your image is just as important as knowing *how* to sharpen it. Sharpening your image should be the very last step before you save the file. If you sharpen too early in the process, you'll end up having to do it again. And sharpening too often can result in image degradation.

Once you've made all the necessary adjustments to your photograph—including resizing it to the appropriate output dimensions—you're ready to apply sharpening. For photographs, this usually means turning to the Unsharp Mask filter (Filter: Sharpen: Unsharp Mask).

When you open the Unsharp Mask filter, you'll notice that the default Amount setting is 50 percent. But that's way too much! Change that to 12 percent while making the Radius setting 1 and the Threshold setting 2. These conservative settings will sharpen only the edge pixels, giving your picture more snap without adding unattractive noise. Click on OK to apply the filter, and examine the picture closely. If you need a little more sharpening, apply the filter again at the same settings. Keep applying until the picture looks clean and crisp but not over-sharpened to the point that it appears grainy. It's actually better to apply the filter three times at 12 percent than once at 50 percent.—DERRICK STORY

Make Your Subject Stand Out

If you want one area of an image to really grab a viewer's attention, tone down the rest of the image. I take a



KELLY LUNSFORD

In Focus To make your subjects really stand out from their surroundings, desaturate and blur the background.

▼ LEARN FROM YOUR MISTAKES WITH METADATA

A big drawback in film photography is the time gap between the moment you press the shutter and when you actually see the finished print. If an image turns out great, you probably won't be able to remember the settings you used and then repeat your success in the future. And if it's a lousy photo, what do you need to do differently next time to avoid making the same mistake?

Digital photographers have an advantage here. Every time you take a picture, your digital camera records a chunk of information, called *metadata*, in the picture file. Valuable details such as time, date, shutter speed, aperture, ISO, flash, white balance, metering pattern, focal length, and more are captured right along with the image itself.

You can view metadata in image editors such as Photoshop or Photoshop Elements via the File Browser (in the Windows menu) or in iPhoto by selecting Show Photo Info from the File menu (⌘-I). By looking at what your camera's settings were when you took a photo, you can determine what to change—or repeat—when you're in a similar situation.

To see what you can learn from your metadata, consider this picture of Cathedral Rock, in Sedona, Arizona (see "Room to Improve"). It's a decent enough shot, but when I reviewed it closely on my PowerBook, I noticed a few things that bothered me. The picture isn't as sharp and detailed as I like landscapes to be. Also, the lighting is a little harsh. To see why, I opened Show Picture Info in iPhoto 2.

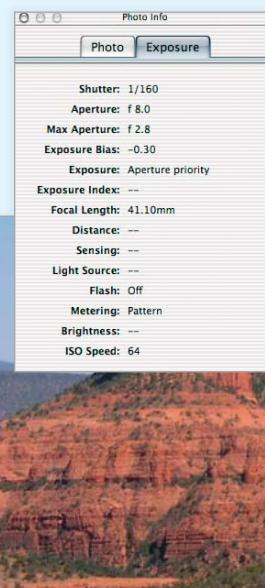
First I clicked on the Exposure tab (see "Behind the Scenes"). At a quick glance, everything looks pretty good. I used a decent shutter speed, middle aperture for good depth of field, and . . . ah, there's the culprit: look at the Focal Length setting: the camera was zoomed out to 41.10mm. I know that the optical zoom on this particular Olympus goes only to 21.3mm. That means I must have activated the digital zoom to extend my range. A digital zoom isn't a true zoom—it just enlarges the pixels without capturing more detail. I activated it, and I paid the price: I lost image quality. Next time, I'll stick with the optical zoom and crop the photo to give the appearance of being closer, without inadvertently softening the picture.

two-pronged approach to this; first, I wash out some of the color; then I blur the background (see "In Focus").

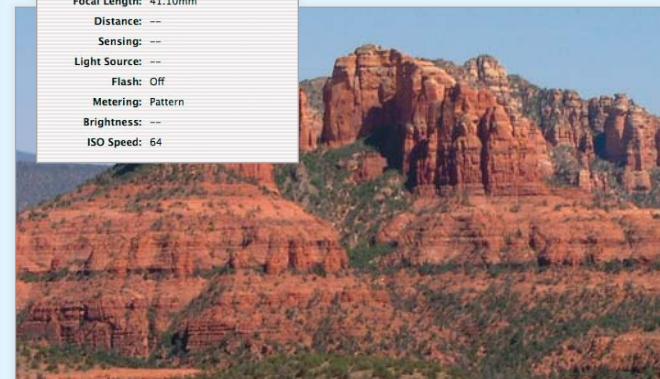
To remove color from the less important areas of your photograph, create a new layer (Layer: New: Layer) and change the blending mode at the top of the Layers palette from Normal to Saturation. Select a brush from the Tools palette, set your foreground color to black, and paint over the areas of the image you want to desaturate. Make sure that your brush's Opacity and Flow options are set to 100 percent. After you've removed the color from the back-

I also checked the information under the Photo tab. There I see that I shot the picture at 2:45 p.m. That would explain the unpleasant shadows. (That's not exactly sweet light for landscapes.) If I'd returned to the exact same spot just a few hours later, I could have gotten a more dramatic image and still a good light angle.

This kind of analysis can help you better understand your shooting technique and, in the long run, help you improve the quality of your pictures.—DS



Behind the Scenes The Exposure tab in iPhoto's Picture Information window reveals the camera settings at the time of exposure. Here I see that I used a digital zoom for this image, which explains why it's fuzzy.



DERRICK STORY

Room to Improve This photo of Cathedral Rock isn't bad, but it could be better. Studying the metadata helped me understand how to come away with an improved shot next time.

ground, use the Opacity slider in the Layers palette to let just a hint of the original color show through.

To make the same area slightly blurry, press the ⌘ key and click on the title of the layer you created in the first step. Photoshop will turn the area you painted into a selection. (Press ⌘-H to hide the selection outline if it's too distracting.) Now click on the bottom layer in your image (the one that contains the original photo), and choose Filter: Blur: Gaussian Blur. Experiment with the Radius setting until your main subject separates nicely from the now-blurry background.—BW

▼ REMOVE UNWANTED COLOR CASTS



What looks white to you may look blue or pink to your camera. While the human eye can compensate quickly for differences in light, cameras tend to be more literal. But you can easily get rid of these unwanted colors and return whites to their true color in Photoshop. To do this, you use levels to neutralize the white, black, and gray pixels in your image.

For a step-by-step guide that will show you how to cast out troublesome tints from your digital images, go to www.macworld.com/2000/10/bc/howtocolor.

GET YOUR DIGITAL PICTURES OUT OF YOUR MAC AND INTO THE SPOTLIGHT

After putting a lot of effort into enhancing your images, you'll want to show them off. Paper prints may not be cutting edge, but sometimes you want physical photos. There are two ways to transform your digital files into prints: by sending them to an online printing service or by printing them on your own ink-jet photo printer. Printing photos yourself gives you more flexibility, and it can be fun—once you've mastered a few of the basics. (For our take on the best printing services, see "Choosing an Online Photo Service.")

Ink-jet printing has reached quality levels that rival, and in some ways surpass, conventional wet-darkroom photographic prints. But all photo printers aren't created equal. To choose the one that's right for you, just answer some simple questions:

What Size Do You Need?

Ink-jet photo printers range from small, desktop-size models that handle letter-size paper, to the somewhat larger tabloid-size (11 by 17 inches) and Super-B-size (13 by 19 inches) models, to floor-standing models capable of producing prints as wide as 44 inches. Most of us are fine with letter-size printers. Digital captures from 4-megapixel cameras make beautiful 8-by-10-inch, or sometimes larger, prints. But there's no need for a machine that makes 40-by-60-inch prints unless your image can be reproduced at that size without looking terrible.

What Resolution Do You Need?

Photo-printer resolution is an almost meaningless specification. A 1,440-by-2,880-dpi printer won't necessarily produce finer detail than a printer with a 1,200-by-2,400-dpi resolution. The numbers refer to the accuracy with which printers lay down a dot of

ink. The more important consideration is the minimum size of that dot.

Look for droplet sizes of 4 picoliters or less for good photographic output. Droplet size relates directly to highlight detail: the smaller the droplet, the better the range of tones the printer can produce in the highlights. Most ink-jet photo printers also use light cyan and light magenta inks to give the illusion of smaller dots; this makes your prints look more like traditional photos. These types of printers are usually referred to as six-color printers, and they're your best bet.

There's another reason a printer's resolution isn't the sole indicator of its performance: You can make great prints from fairly low-resolution images. Just because a printer has a resolution of, say, 1,440 by 720 dpi doesn't mean you should send it a 720-pixel-per-inch file. Printer dots and image pixels are very different animals, so there's rarely a reason to use resolutions higher than 360 pixels per inch, and you can often obtain very good results with fewer.

What Kind of Inks Do You Want?

Some photo printers use dye-based inks, while others use pigments. Both types typically cost about the same, but each has advantages and disadvantages.

Longevity The main benefit of pigment-based inks is longevity. On the right paper, pigment-based prints will last 80 to 100 years in reasonable display conditions under glass (compared with around 85 years for the best film prints). Dye-based inks are much more fleeting, with life spans as long as 25 years or so.

Dye-based inks are also more vulnerable than pigments to airborne contaminants that often attack one ink color more than the others, resulting in a sudden

▼ OUR FAVORITE PHOTO PRINTERS

If you're looking to start your own digital darkroom at home, a good photo printer is essential. The printer market changes at a fairly rapid pace as companies race to keep up with new technology. The upside to all this turnover: prices drop as quality improves. The downside: the field of contenders is vast, and the differences between printers aren't always obvious.

Here's a quick look at three current six-color ink-jet printers that we especially like. Because different people value different features in photo printers, we've selected a range, with prices from \$199 to \$699, so you can find one that fits your specific needs.



EPSON STYLUS PHOTO 2200

This impressive printer produces a good range of colors and fine details, but it's pricey (4 1/2; October 2002).

COMPANY: Epson, 800/463-7766, www.epson.com

PRICE: \$699



EPSON STYLUS PHOTO 900

This printer can produce borderless prints as large as 8.5 by 11 inches—or print on CDs and DVDs (4 1/2; August 2003).

COMPANY: Epson, 800/463-7766, www.epson.com

PRICE: \$199



CANON i950

This photo printer has an impressively small droplet size—two picoliters—and individual ink cartridges.

COMPANY: Canon, 800/652-2666, www.usa.canon.com

PRICE: \$249

color shift rather than a general fading. You can avoid this by keeping your prints mounted under glass or in archival sleeves, but if you're unwilling to do that and you're concerned about longevity, pigments may be a better choice.

Color Range Dyes produce a wider range of color, and sometimes denser blacks, than pigments, so your prints sometimes offer a more faithful reproduction of the original. (For more about accurate color, see "The Color Gamble.") Prints from dyes also don't suffer from the gloss differential that can plague pigment-based prints: pigment inks, especially on glossy paper, can produce an effect where heavily inked areas have a different surface reflection than the less-inked areas. But you can largely eliminate the effect by framing the prints under glass.

Third-Party Inks Most printer manufacturers recommend that you use only their inks. You may be tempted to use inks sold by other companies, either because they're cheaper or because they offer some desirable quality the vendor-supplied inks lack. Plenty of people use third-party inks successfully every day, but you shouldn't assume that every ink works in every printer. (Epson's ink cartridges, for example, contain an embedded chip identifying them as Epson cartridges, so third-party inks don't function unless vendors refill Epson cartridges or clone the chips.) And by using third-party inks, you may void the manufacturer's warranty. The inks may also cause problems such as persistent clogging of the nozzles, and they may contribute to the premature demise of your printer.

What Else Do You Need?

Some photo printers let you pop your digital-camera media into a built-in card reader on the printer and make prints without using a computer. The convenience is appealing, but you do give up control, with no opportunity to correct color, crop, and so on. Other extras include printing directly on CDs, and borderless printing. Only you can decide whether these features are worth the higher price that may come with them.

What's the Cost per Print?

Bear in mind that the cost of buying a photo printer is dwarfed by the cost of owning one—essentially, they're ink delivery systems, and the inks and papers cost much more than those for general-purpose use. So factor the per-print cost (printer companies usually list these on their Web sites) into your buying decision. Price differences in the printers themselves can be relatively trivial.

What Papers Do You Want?

Your buying decisions don't stop with a printer. You may also want to experiment with specialty papers. Different surfaces yield very different results. Glossy papers tend to provide brighter colors and more contrast, while matte-finish papers can produce more pastel-like colors. This is due to the way the papers absorb and disperse the ink. With looser-weave papers, such as watercolor and handmade

▼ THE COLOR GAMBLE

Your photos of the Grand Canyon didn't turn out to be quite the artistic masterpieces you envisioned. So you labor long in an image editor, fixing problems and framing shots, and everything looks perfect—until you send the images to your printer. Why don't prints look like what you see on screen?

Getting a match between your monitor and what comes out of your printer is difficult for a couple of reasons. Monitors often display colors incorrectly; for example, a pinkish-white flower may have a bluish cast on screen. What's more, monitors can display colors that no printer can reproduce.

There are ways to tweak your monitor and printer so that you're rarely surprised by your prints. For the greatest color accuracy, you'll have to invest a few hundred dollars and significant effort. But in the meantime, you can take a few steps that will get you a little closer to more predictable color.

First, visually calibrate your monitor to put it as close to neutral as possible. In OS X, you can calibrate by going to System Preferences: Display: Color. In the Display Profile menu, either choose the name that matches your monitor or, if that's not an option, choose sRGB Profile. Then click on Calibrate and follow the instructions.

Next, set your image editor to a default color space of sRGB. In Photoshop, go to Photoshop: Color Settings. In the Settings drop-down menu, pick Web Graphics Defaults. In Elements, go to Photoshop Elements: Color Settings and choose Limited Color Management.

Finally, tell your printer how to convert your digital camera files to your printer's color space. In your image editor, choose Print. In the Copies & Pages drop-down menu, look for a Color Control or Color Management option. The exact location and wording differs among printers, so you may have to dig a little. Once you've found the Color Control or Color Management option, choose ColorSync or Automatic. Then you can click on Print as you would normally.—MACWORLD STAFF

More Info:

There's much more to learn about color matching. The following resources will help:
[Apple](http://www.apple.com/colorsync) (www.apple.com/colorsync)
[creativepro.com](http://creativepro.com/category/home/231.html) ([www.creativepro.com/category/home/231.html](http://creativepro.com/category/home/231.html))
[InkjetMall](http://www.inkjetmall.com/store/cm/color-management.html) (www.inkjetmall.com/store/cm/color-management.html)
[Macworld](http://www.macworld.com/2001/04/bc/howtocolor) (www.macworld.com/2001/04/bc/howtocolor)

papers, your images might start to take on more of a painterly look as colors bleed together and trace the grain of the paper. Many printer manufacturers sell watercolor and other fine-art media; art supply stores are another source of unusual types of paper.

Keep a couple of things in mind as you experiment with papers. Your printer probably has a maximum thickness specification (look in the documentation that came with the printer). Feeding papers thicker than that specification through your printer could smear your print and even damage the printhead. Though most papers meant for printers list their thickness, specialty or handmade papers may not. You'll have to visually compare art paper with paper of known thickness to stay in the safe zone.

Even if they're the right thickness, slick or varnished papers—the type used for paperback book covers—may not work in your printer because the ink won't adhere to the slippery surface. These prints may look fine coming out of the printer, but they may never dry.

Whatever paper you choose, you'll have to make color adjustments by trial and error. So plan on buying a big stack.—BRUCE FRASER AND BEN LONG

continues

▼ CHOOSING AN ONLINE PHOTO SERVICE

If you don't want to print your digital photos yourself, there are plenty of online services that will print your images on high-quality photo paper and mail them to you. To see how these services stack up, I ordered prints from 14 competitors—AnyTime Photo, Club Photo, dotPhoto, eFrames, EZ Prints, ImageStation, iPhoto, Kodak Picture Center Online, Ofoto, PhotoAccess, Photo Center, PhotoWorks, Shutterfly, and Snapfish—and compared their features, prices, and print quality. Although many of the results echoed the findings from previous tests (see "Turn Pixels into Prints," June 2002), there were a couple of surprises.

Uploading Your Files

For getting digital images from your Mac to the company's server, Apple's iPhoto software offers the simplest solution. Once you import your pictures into iPhoto and set up an Apple account, you select as many photos as you want and click on the Order Prints button; the application takes care of everything else.

Handing over your images to any of the other services requires a few extra steps. All of the services (aside from iPhoto) let you upload photos through a Web browser. But because there are limitations on the number of files you can upload at once—and, in some cases, file-size limitations—I recommend using a service that lets you upload images through a dedicated application. This lets you do much of the work on your desktop and then upload the entire batch in one step. PhotoAccess, Shutterfly, and Club Photo all provide uploading software. Of the three, PhotoAccess stands out with its PhotoStreamer software, which can not only upload pictures from iPhoto but also download images directly from your camera. PhotoStreamer and Shutterfly's SmartUpload software are compatible with OS 9 and OS X. (Club Photo's PhotoDrop is OS 9 only.)

ImageStation lets you either use its browser plug-in to drag and drop an unlimited number of files for upload or attach photos to an e-mail message. If you have a slow connection, you may appreciate the ability to queue a message and send it at a time when you don't need the bandwidth for other purposes. In addition to an e-mail option, dotPhoto lets you upload files via FTP.

Editing Images

I don't recommend relying on any online services for extensive image editing. That said, ImageStation, iPhoto, Ofoto, and Shutterfly give you the most editing choices, including options to fix red eye, sharpen, adjust brightness, and add effects such as tints and borders. And you'll definitely want to take advantage of cropping tools. Digital images are larger than film images, so you should crop out the extra space before you have the images printed on traditional paper sizes. If you don't, you may receive unexpectedly cropped prints, or prints that sport unattractive white bars. iPhoto's cropping tools (which you can use even if you print from another service) include preset ratios for common print sizes such as 4 by 6 inches and 5 by 7 inches.

Print Quality

Of course, the most important criterion for any online service is the quality of its prints. A panel of *Macworld* jurors judged a set of eight prints from each service, measuring detail, color accuracy, noise, and more. Each juror chose two favorites.



JUSTINWOLFF

Seeing the Difference Think all photo services are equal? Here is the same print from Club Photo (left) and PhotoAccess (right). Club Photo blew out a lot of valuable detail in the sand.

PhotoAccess, Ofoto, PhotoWorks, and Shutterfly all made it to the top of the panel's A-list. PhotoAccess received the highest score. Despite a slight red tint in skin tones, it maintained excellent shadow detail without blowing out lighter areas. Ofoto also scored well; three of the five jurors voted it their favorite. (Interestingly, iPhoto didn't score as well as Ofoto, though both use the same service.)

PhotoWorks showed a sharp improvement since our last look at online services. Its prints retained detail without washing out, and they showed none of the problems with over-sharpening that we noticed last time. Several jurors also lauded the accuracy of the Shutterfly prints.

Although they didn't have serious flaws, prints from iPhoto and EZ Prints were knocked out of the top positions due to muddy details and some problems with noise. Prints from Club Photo and ImageStation had noticeable vertical lines, almost as if they'd been printed from a low-quality ink-jet. Photos from AnyTime Photo, eFrames, and Snapfish all suffered from significant noise.

The jury was unanimous, however, in voting prints from WalMart's Photo Center as the worst of the lot. The photos showed way too much contrast, and they were the noisiest of the bunch.

Ordering Prints

All of the services offer standard print sizes such as 4 by 6, 5 by 7, and wallet size. But if you want something a little unusual, EZ Prints has a particularly wide selection of sizes. PhotoAccess can also produce slides.

Our Choice

With its easy-to-use OS X application and excellent print quality, PhotoAccess is a solid choice, although a volume discount to offset the relatively steep price would be welcome. Ofoto, PhotoWorks, and Shutterfly are also fine options. Shutterfly lets you print captions on the backs of photos, which can help you identify images now and years later. If you print a lot of photos, PhotoWorks' price (\$0.29 for a 4-by-6 print) is an enticing offer. PhotoWorks also gives you the option of archiving your prints on Photo CDs and DVDs.—TERRI STONE

Top Online Photo Services				Output Options (dimensions in inches)							
SERVICE	URL	UPLOAD OPTIONS	EDITING TOOLS	MATTE FINISHING	3 x 5	4 x 6	5 x 7	8 x 10	12 x 18	SET OF 4 WALLET PHOTOS	
Ofoto	www.ofoto.com	Web form sepia, tints, borders	instant fix, crop, red eye, black-and-white	no	N/A	\$0.49*	\$0.99*	\$3.99	N/A	\$1.79	
PhotoAccess	www.photoaccess.com	OS 9 and OS X applications, Web form	rotate, crop (with centering options)	yes	\$0.39 (3.5x5)	\$0.45	\$0.95	\$3.49	\$11.95	\$1.49	
PhotoWorks	http://photoworks.com	Web form	rotate, sepia, black-and-white	no	\$0.29	\$0.29	\$0.99	\$2.99	N/A	\$0.99	
Shutterfly	www.shutterfly.com	OS 9 and OS X applications, Web form	red eye, crop, rotate, black-and-white, color tints, saturate, soft focus, borders	no	N/A	\$0.49*	\$0.99*	\$3.99*	N/A	\$1.79	

N/A=not applicable. *Volume discount available.

HOW A PROFESSIONAL PHOTOGRAPHER KEEPS IT TOGETHER WITH iPHOTO

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I've taken roughly 10,000 digital photos in the past year alone—and each and every one of them was organized, tracked, and archived with iPhoto. I'm not kidding. Apple's digital shoe box is far more powerful than most people give it credit for. In fact, once you know how to maximize iPhoto's capacity, this free, easy-to-use program quickly becomes a full-fledged image-management system.

Secrets of the iPhoto Library The first time you launch iPhoto, the program creates the iPhoto Library folder in your Pictures directory (Users: *your user folder*: Pictures: iPhoto Library). This is where it stores all of your images. iPhoto is very particular about how it organizes information, so it's best not to go into the folder and play around. You just need to know *where* it is.

Your iPhoto Library folder isn't a bottomless hole. As you add pictures, the size of your library grows until it eventually hits the limit of what your Mac can manage. This can slow iPhoto's performance to a crawl.

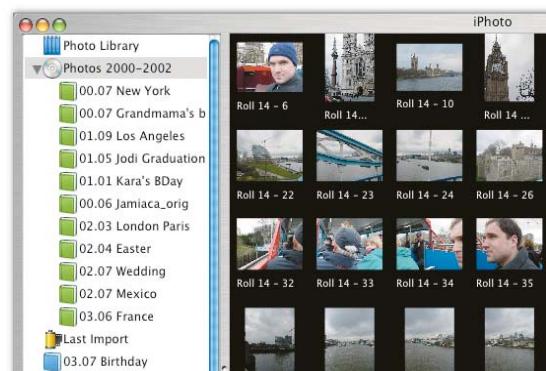
The goal, then, is to keep the size of your iPhoto Library manageable while also having all of your photos at your fingertips.

You may not realize that you can have more than one iPhoto Library. This fact, combined with iPhoto 2's new Burn feature, makes it possible to create an entire catalog of iPhoto libraries—each small enough to keep iPhoto running smoothly. Once one library reaches the capacity that you've deemed proper for your Mac, you can stop adding to it, back it up to optical media, and create another. As your image library grows, so will your media library.

Managing the Size of Your Library Folder For this process to work, you'll need to limit the size of your iPhoto Library to what you can comfortably back up onto optical media. A general guideline is 640MB for CDs or a couple of gigabytes for DVDs—depending on how much processing power your computer has.

You can monitor the size of the iPhoto Library from within iPhoto by clicking on Photo Library in the top left corner and reading the data display located beneath the column. Make sure no individual photos are selected when you do this, or the data will reflect the size of that image, not the entire library.

Once your library reaches its maximum size, you're ready to burn it to a CD or DVD. While you're in



Double Your Library When you insert an optical disc into your Mac, iPhoto displays your archived image library—complete with individual albums—just beneath your existing Photo Library.

Organize mode, click on Photo Library and then click on the Burn icon in the lower right corner of the window. When prompted, insert a blank disc. A disc icon will appear with the description "iPhoto Library" and the date. Change that name to a more useful title—something that will help you identify what's on the disc.

Lastly, click on the pulsating Burn button to transfer the library to disc. You should burn at least two discs for each iPhoto Library—one for everyday use and another to be stored off-site for archival purposes.

When the process is finished, iPhoto will automatically eject the disc. Your entire iPhoto Library is now safely backed up to optical media.

Access Images from Burned Discs To access the pictures on your new CD or DVD, just insert the disc into your computer. iPhoto will automatically launch and display the archived library right below your existing iPhoto Library. Click on the triangle next to your new library to reveal all of your custom albums. In fact, the only thing you'll lose in this process is the name of individual film rolls. (This bug should be fixed in an upcoming iPhoto update.)

Take a moment to verify that all of your images are safely on the disc. Then eject it and quit iPhoto.

Create a New Library Make sure that iPhoto isn't running. Go to your Pictures directory, drag your iPhoto Library folder to the Trash, and then empty the Trash. (Remember, you've already verified that this library is safe and sound on at least two optical discs.) Now launch iPhoto. When it asks whether you want to create a new library, click on Yes. iPhoto will place a new iPhoto Library in your Pictures directory. You can add new pictures to it until it's full. Then you can start the process all over again.

Keep Track of Your Disc Once you have a few iPhoto Library CDs or DVDs stored away, you can use a CD cataloger to help keep track of what's on each disc. Nobert Doerner's CDFinder (\$25; www.cdfinder.de), for example, lets you search through all of your discs by keyword.—DS

▼ NO BURN? NO PROBLEM

If your Mac doesn't have a CD-RW or DVD-R drive, you can still prevent iPhoto from getting bogged down—break up your photos into multiple libraries. Brian Webster's free iPhoto Library Manager utility (www.homepage.mac.com/bwebster/iphotolibrarymanager.html) lets you organize your photos into a number of separate libraries, share libraries with other users, and switch easily from one library to another—even if the libraries reside on external FireWire drives. Plus, each library can have its own set of preferences and permissions.—DS